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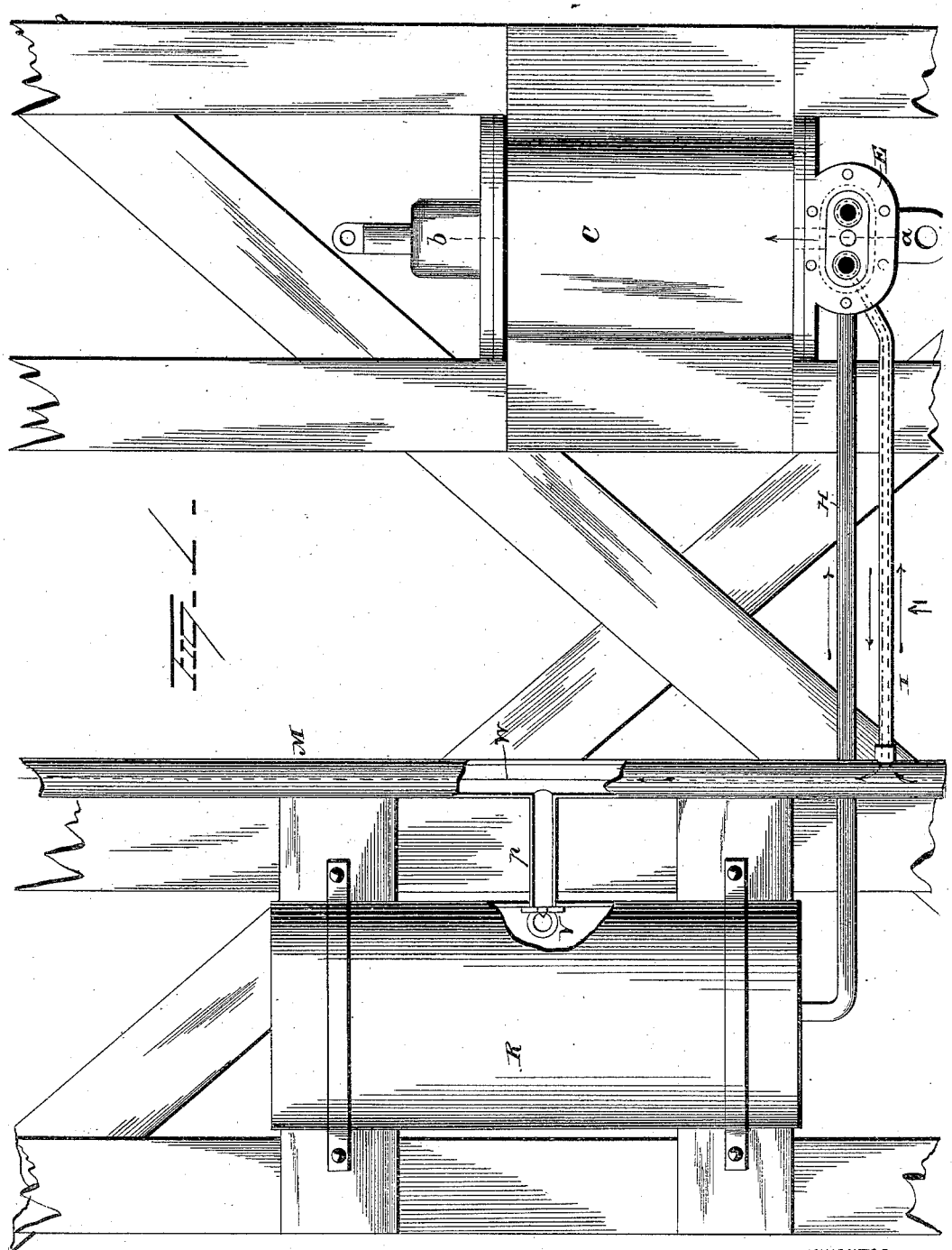
H. FLAD.

CAR BRAKE.

No. 307,534. Patented Nov. 4, 1884.



WITNESSES

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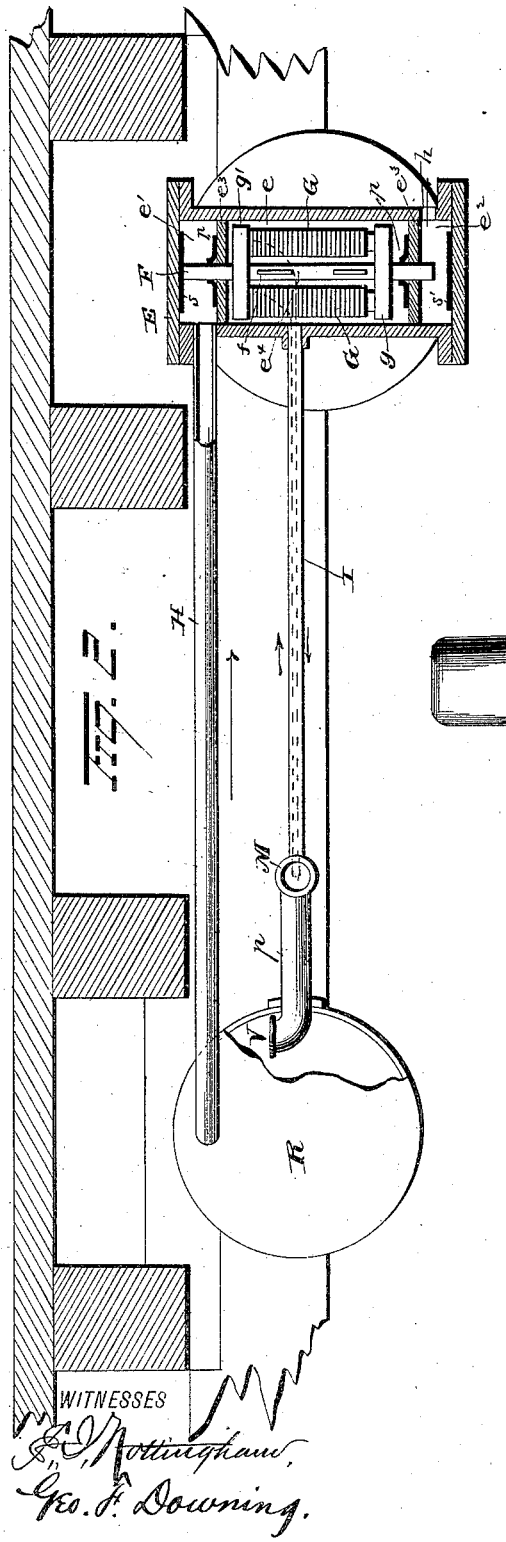

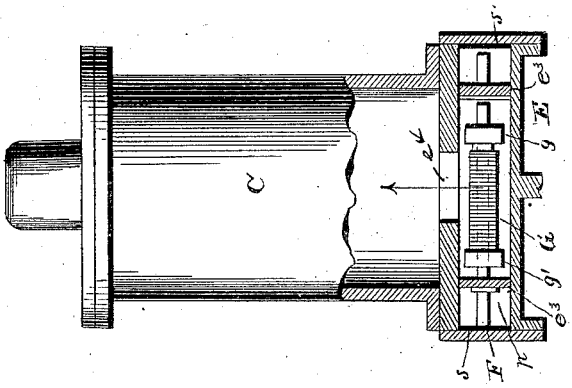

Fig. 2.

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4 Sheets—Sheet 3.

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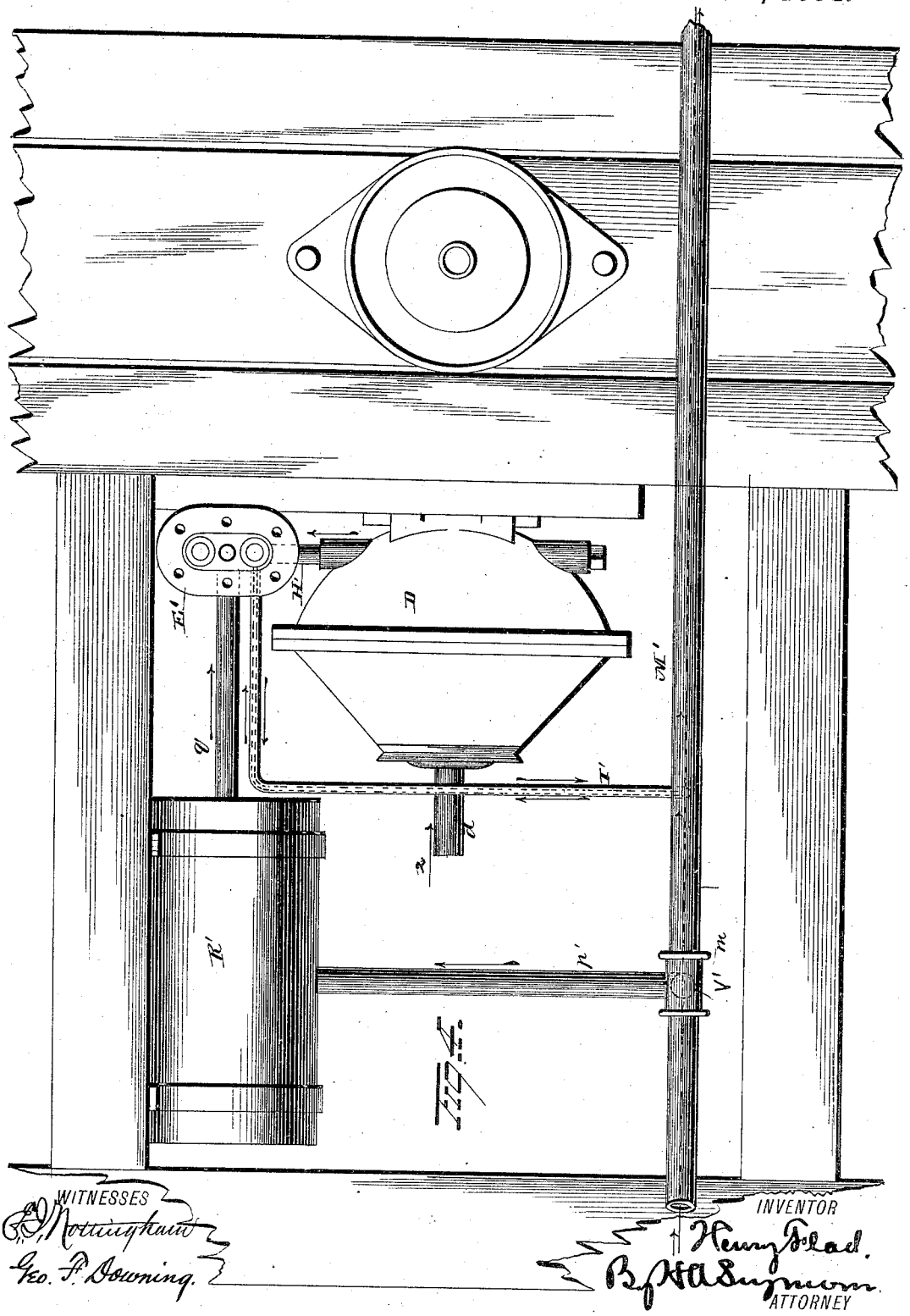

Fig. 1.

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4 Sheets—Sheet 4.

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No. 307,534. Patented Nov. 4, 1884.

Fig. 5.

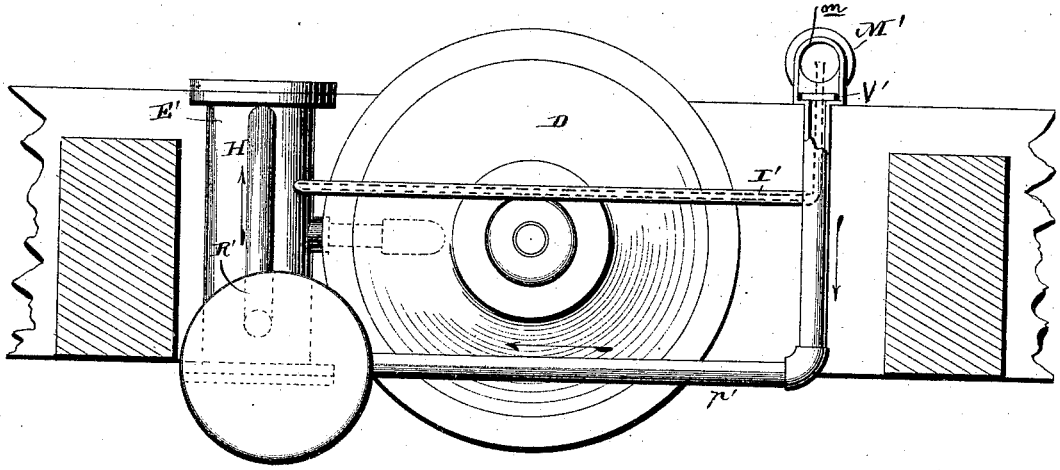
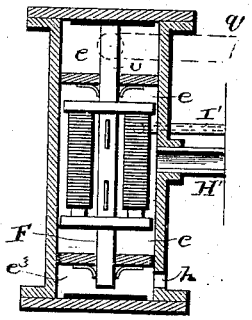


Fig. 6.



WITNESSES

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UNITED STATES PATENT OFFICE.

HENRY FLAD, OF ST. LOUIS, MISSOURI, ASSIGNOR TO THE ELECTRO MAGNETIC BRAKE COMPANY, OF EAST ST. LOUIS, ILLINOIS.

CAR-BRAKE.

SPECIFICATION forming part of Letters Patent No. 307,534, dated November 4, 1884.

Application filed April 9, 1884. (No model.)

To all whom it may concern:

Be it known that I, HENRY FLAD, of St. Louis, in the county of St. Louis and State of Missouri, have invented certain new and useful Improvements in Car-Brakes; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to air-brake apparatus for railway-cars in which the valves upon the several cars are controlled by electro-magnetism.

The objects of my improvement are to provide for the simultaneous application and simultaneous release of the brakes on all the cars of the train, and to furnish a simple and reliable attachment whereby either compressed-air or vacuum brakes may be rendered automatic in their action for applying the brakes to a train of cars in case of accident resulting in the breakage of the main air-pipes or the rupture of the electric circuit by means of which the valves are operated.

My invention is especially applicable to the Westinghouse compressed-air brake and to the Eames and similar vacuum-brakes, its application to such brakes involving very slight expense, and enabling the engineer to operate them simultaneously on all the cars of a train. By combining with it my improvement the ordinary Westinghouse compressed-air brake is rendered automatic without the use of a triple valve.

In the accomplishment of its intended purposes my invention consists in certain novel constructions and combinations of devices, which will be fully understood from the following particular description, in connection with the accompanying drawings, in which—

Figure 1 is a bottom view of a compressed-air-brake apparatus provided with my improvement. Fig. 2 is a view of the same partially in elevation and partially in vertical section, the line of sight being in the direction of the arrow No. 1 in Fig. 1. Fig. 3 is a sectional view on *a* and *b* of Fig. 1. Fig. 4 is a bottom view of a vacuum-brake apparatus provided with my improvement. Fig. 5 is a view of the same partially in elevation and partially in vertical section, looking in the direction of the arrow No. 2 in Fig. 4. Fig. 6 is a detached vertical section of the chamber containing the electro-magnetic valve apparatus, which is shown in full lines.

Referring to Fig. 1, the letter M indicates the main air-pipe, which is to be connected from car to car and to the usual apparatus on the engine for conveying compressed air, as in the Westinghouse compressed-air-brake system.

R is a compressed-air-brake reservoir, connected with the main pipe by a branch pipe, *p*, which enters the reservoir, and is provided with an inwardly-opening check-valve, V, which prevents air from escaping from the reservoir through pipe *p*.

C is the brake-cylinder, vertically across the head of which is arranged a chamber, E, which is divided into three compartments, *e* *e'* *e²*. The middle compartment, *e*, is larger than the other two and divided therefrom by partitions *e³* *e³*. This middle compartment communicates with the brake-cylinder by means of a central opening or passage, *e⁴*, which is formed through the head of the brake-cylinder and the wall of the chamber E. The partitions *e³* *e³* have central apertures, and through both of these partitions is arranged a tubular valve, F, in the intermediate portion of which, lying in the compartment *e*, are apertures *f*, connecting the bore of the valve with the compartment. Within this compartment *e* is vertically supported an electro-magnet, G, having its poles turned downward to act upon armature *g*, which is carried by the tubular valve F, and in its yoke-piece *g'* is an aperture, through which said valve loosely plays.

Upon the inner surfaces of the upper and lower heads, respectively, of the chamber E are formed seats *s* and *s'*, against which the opposite ends of the valve may alternately impinge, so that the ends of said valve may be alternately opened and closed. The upper compartment, *e'*, of the chamber E is connected with the reservoir R by a pipe, H, and the lower compartment, *e²*, of said chamber communicates with the external air by means of a port or passage, *h*. The middle or larger com-

partment, *e*, of the chamber E is connected with the main air-pipe M by a small pipe, I.

Through the main air-pipe M is arranged an insulated electrical conducting-wire, W, a loop of which extends laterally through the small pipe I, and includes the coils of the electro-magnet G. This conducting-wire is to be provided with couplings combined with the pipe-couplings at the opposite ends of the car, in the manner shown in my Patent No. 296,546, April 8, 1884, and the complete electrical circuit and devices for opening and closing the same may be such as shown in my said patent.

In operating my new apparatus as now described a current of electricity is to be kept continually upon the circuit of which the wire W forms a part, and thus the electro-magnet G will be kept constantly energized, and will hold up its armature *g*, so that the upper end of the tubular valve F will be driven against its upper seat, *s*. The reservoir R being charged with compressed air in the usual manner and by the well-known means, it will be observed that the air cannot escape from said reservoir, because the check-valve V will be closed by its pressure, and the pipe H, which is the only other outlet of the reservoir, opens into the small compartment *e'*, which is closed air-tight by the packing *p'*, which surrounds the tubular valve. In this position of the parts it will be understood that only the ordinary atmospheric pressure is exerted on the piston in the brake-cylinder, because the external air has free communication with the interior of said cylinder through the passage *h*, tubular valve F, its apertures *f*, and the passage e^4, leading from the middle compartment, *e*, of the chamber E to the interior of said brake-cylinder. If, now, the brakes are to be put on or applied to the car-wheels, the engineer breaks the electric circuit and the magnet G releases its armature, and thus allows it and the tubular valve F to drop, so that the lower end of said tubular valve will be closed against its lower seat and opened at its upper end, so that the compressed air will rush from the reservoir through the pipe H into the small compartment *e'* of the chamber E, and thence pass down through the tubular valve F, its apertures *f*, and the passage e^4 to the interior of the brake-cylinder, and drive its piston outward to apply the brakes, in the usual manner. The valve may drop by gravity, or may be assisted by a spring, if desired. When it is desired to relieve the brakes, the engineer simply closes the circuit, thus cutting off communication between the brake-cylinder and the reservoir, and opening communication between said cylinder and the external air, as before explained, so that the compressed air will escape from the cylinder and allow the brakes to ease off from the wheels. When a train is broken by one or more cars becoming accidentally detached, the pipe or hose couplings and wire couplings will be torn off, the electric circuit will be broken, and the compressed air in the main pipe will escape. The compressed air, however, cannot escape from the reservoir through the main pipe, because the check-valve V will be closed by the internal pressure, and now, as the electric circuit is broken, the magnet G allows its armature and the tubular valve F to drop, so that the lower end of said valve will be closed and the upper end open, thus allowing the compressed air from the reservoir to rush into the brake-cylinder through the passages before described, and drive the piston to set the brakes. Thus it will be seen that the apparatus acts automatically to set the brakes and stop the train should one or more cars become accidentally detached.

The only change in operation required in the ordinary Westinghouse brake is that the main pipe M must be kept constantly charged with compressed air, instead of being filled only at such times as the brakes are to be applied.

Referring now to Figs. 4 and 5, illustrating the application of my improvement to a vacuum-brake, the letter M' indicates the main air-pipe. R' is the reservoir, connected with the main pipe by a branch pipe, *p'*, which extends into an enlarged portion, *m*, of the main pipe, and is provided with a check-valve, V', in said enlarged portion.

The letter E' indicates a detached chamber similar to the chamber E in Fig. 1, and connected with the reservoir by a pipe, *q*. The chamber E' has within it the compartments, the electro-magnet, armature, tubular valve, and seats constructed and arranged precisely as described heretofore for the chamber E; but the connections are somewhat different—as, for instance, the pipe *q*, leading from the reservoir, connects with the upper compartment, *e'*, of this chamber E', and from its middle compartment, *e*, a pipe, H', leads to the collapsible chamber or diaphragm D, connecting therewith in the manner usual in vacuum-brakes. This collapsible chamber has connected with its collapsing wall a bar or rod, *d*, for connection with the brakes, which are unnecessary to be shown. A small pipe, I', leading from the main pipe to the middle compartment of the chamber E', serves as a conduit for the wire loop extending from the conducting-wire W, and including the coils of the electro-magnet G.

In operating the apparatus as last described the reservoir and main pipe M' are to be kept constantly exhausted of air. The electric circuit is to be kept closed, and a current flowing thereover, so that the electro-magnet G will hold up the tubular valve F and keep its upper end closed, so that there will be no communication between the reservoir and the collapsible chamber or diaphragm D, while at the same time this collapsible chamber will be in free communication with the external air through the pipe H', middle compartment, *e*, tubular valve F, lower compartment, e^2, and passage *h*. When the brakes are to be applied, the electric circuit is to be broken by

any well-known means, either by the engineer or by a conductor on any one of the cars of a train. This breaking of the circuit will allow the tubular valve F to drop, closing its lower and opening its upper end, thus cutting off the diaphragm from the external air and opening communication between it and the reservoir, so that the collapsible chamber will be partially exhausted by the air flowing therefrom into the reservoir. The wall of this chamber, which is connected with the brakes, will therefore collapse and apply the brakes to the wheels, holding them so applied until the electric circuit is again closed. The closing of the circuit results in the raising of the tubular valve and opening communication between the diaphragm and the external air, so that the collapsible chamber again becomes distended and takes off the brakes, after which the main pipe and the reservoir must be again exhausted, ready for another operation in setting the brakes.

In order to make this last-described apparatus automatic for setting the brakes in case of the accidental breakage of a train, the check-valve V′ in the pipe *p′* is arranged to open toward the main pipe M′. When the connections of the main pipe and the electric circuit are broken by the parting of a train, air will rush into the main pipe; but it cannot flow into the reservoir, because the check-valve V′ will be held closed by the combined action of the vacuum or partial vacuum in the reservoir and the pressure of the air which has entered the main pipe. The electric circuit being broken, the tubular valve F drops, opening communication between the reservoir and the collapsible chamber D, while cutting off communication of the latter with the external air. The air will thus be partially exhausted from the collapsible chamber by flowing out to fill the partial vacuum in the reservoir, and thus the brakes will be applied the same as if the electric circuit had simply been broken for that purpose, as before described.

It will be obvious that, however many cars there might be in a train, the valves controlling the brakes will be operated upon all simultaneously by the breaking and closing of the electric circuit.

The packings *p p* around the tubular valve are so arranged that they will be pressed against said valve by the action of the air. The conduit-pipes I I are to be filled with paraffine or a similar substance, in order to prevent air from flowing through said pipes.

I do not confine myself, of course, to the precise construction and arrangement of parts as shown in my drawings, but may vary the same in any manner which may be suggested by considerations of economy or convenience in applying my improvement to particular kinds of air-brakes and to cars of different constructions.

What I claim is—

1. The combination, with the direct brake-operating air-chamber and devices connecting it with the brakes, of the valve-chamber containing the tubular valve, the reservoir connected with said valve-chamber and main pipe, the electro-magnet, and suitable connections for operating said tubular valve for opening communication between the reservoir and the brake-operating chamber by cutting off communication between said chamber and the external air, and vice versa, substantially as described.

2. In an air-brake apparatus, the combination, with the brake cylinder or diaphragm and connections, substantially as described, of the vertical valve-chamber having the compartments *e e′ e²*, the tubular valve extending through the partitions separating said chambers, and having openings from its bore to the intermediate chamber, the armature carried by said valve, and the electro-magnet arranged to attract and release said armature for operating the valve, essentially as set forth.

3. The combination, with the reservoir, brake cylinder or diaphragm, the valve-chamber and valve, and electro-magnet and connections arranged to operate said valve, of the pipe connecting said reservoir and brake-cylinder, and the check-valve arranged to prevent the escape of the air within the reservoir when the main pipe is broken, and the valve released by its magnet, essentially as set forth.

In testimony whereof I have signed this specification in the presence of two subscribing witnesses.

HENRY FLAD.

Witnesses:
DOTHY HÖPPNAR,
E. F. FINNEY.